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# Sediment Monitoring

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## Purpose

Sediment monitoring for the Grassland Bypass Project (Project) focuses on measuring selenium and organic carbon parameters in the San Luis Drain (SLD), Mud Slough, and Salt Slough. The purpose of the monitoring is to assess the selenium concentrations in the sediment samples over the 5-year life of the Project. The measurements within the SLD provide selenium concentration estimates for comparison with California Department of Health Services' hazardous waste criterion. The measurements in Mud and Salt Sloughs provide selenium concentrations for comparison with USFWS thresholds for ecological risk.

## Sampling Locations

Sampling locations for sediment monitoring (Stations A, B, C, D, E, F, and I) are defined in the Project's Compliance Monitoring Plan and depicted in Figure 2, Chapter 1. At the request of USFWS, sediment monitoring within Salt Slough (Station F) was changed from Lander Avenue to a location upstream of the San Luis National Wildlife Refuge used by USFWS for biota monitoring. This change was made for the September 1997 sampling event. Station I was changed at the end of the 5<sup>th</sup> year, water year 2001, and is now located in backwaters of Mud Slough, relatively close to the old station.

## Sampling Frequency

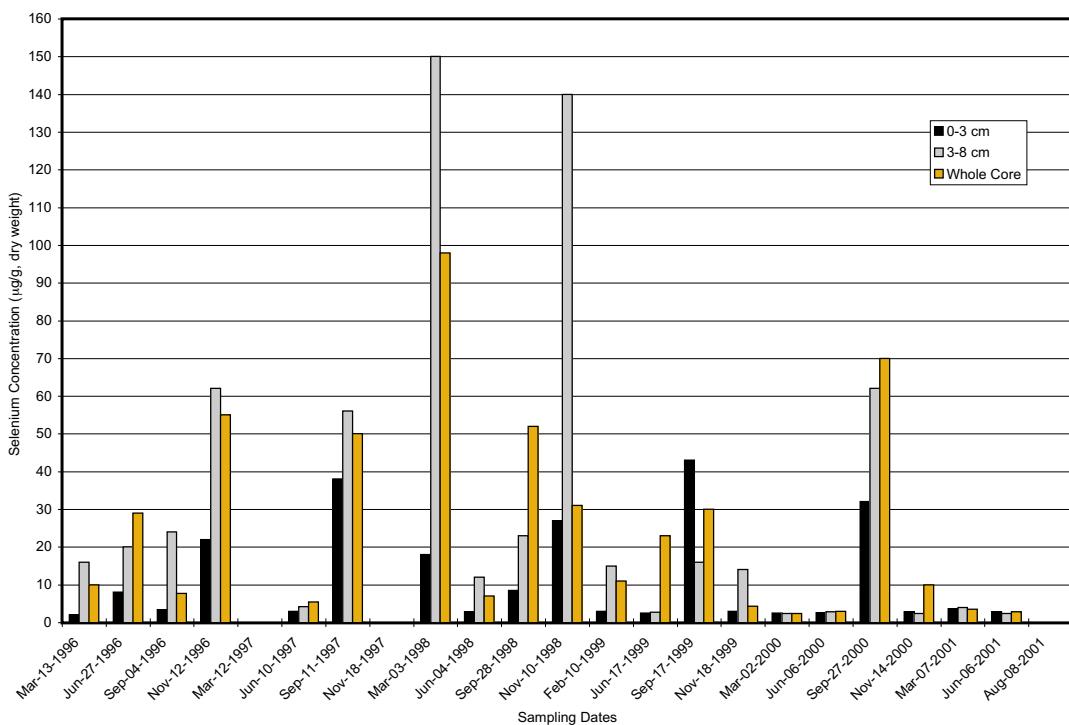
Quarterly sampling periods are November, March, June, and September for each of the water years. The sampling periods correspond with the biota sampling events of the USFWS.

Sampling frequency includes quarterly measurements for Stations A and B (San Luis Drain), Station F (Salt Slough), and Stations C, D, I, and E (Mud Slough). Annual measurements are also made for 10 locations in the SLD.

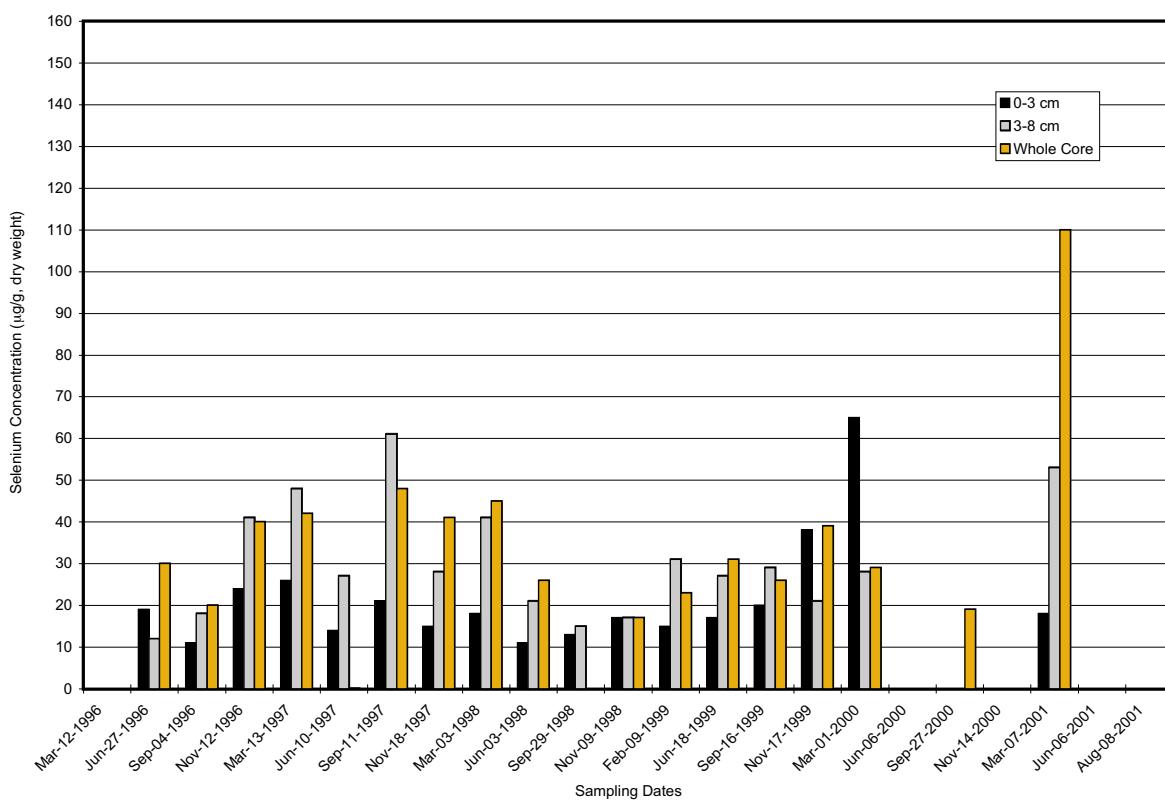
## Sampling Methods

Sediment samples are collected using an acrylic coring device (4.5 cm diameter, 38 cm internal length). After collecting the sediment, sections of the core, 0-3 cm and 3-8 cm, are slowly extruded using a non-metallic internal pushing device and placed in distinct quart size mixing bowls. An additional sample is collected near the same spot for the whole-core sample and placed into a third mixing bowl. The process is continued until three samples along a transect are completed. Material from the 2<sup>nd</sup> and 3<sup>rd</sup> samples are placed in the corresponding 0-3 cm, 3-8 cm and whole-core mixing bowls containing the 1<sup>st</sup> samples. Each of the mixing bowls contain material from the transect. The 0-3 cm, 3-8 cm, and whole core samples are then mixed well in their mixing

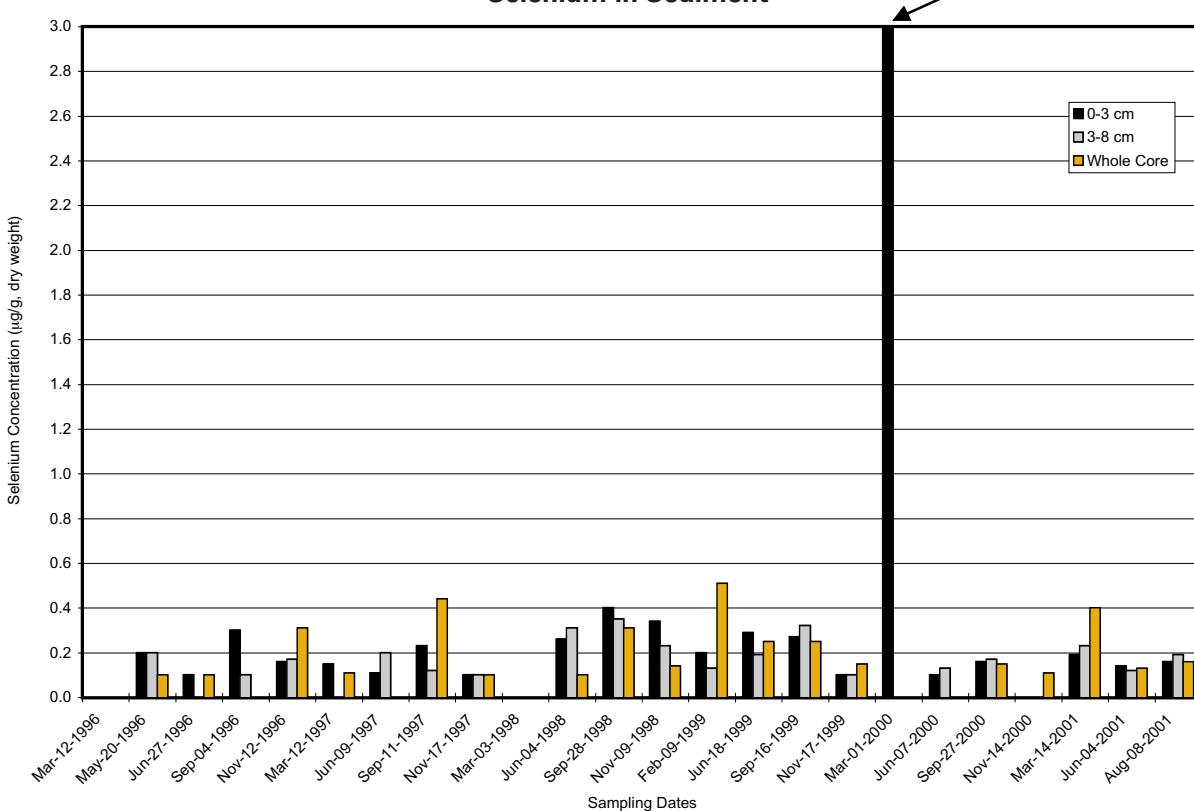
**Station A  
Selenium in Sediment**



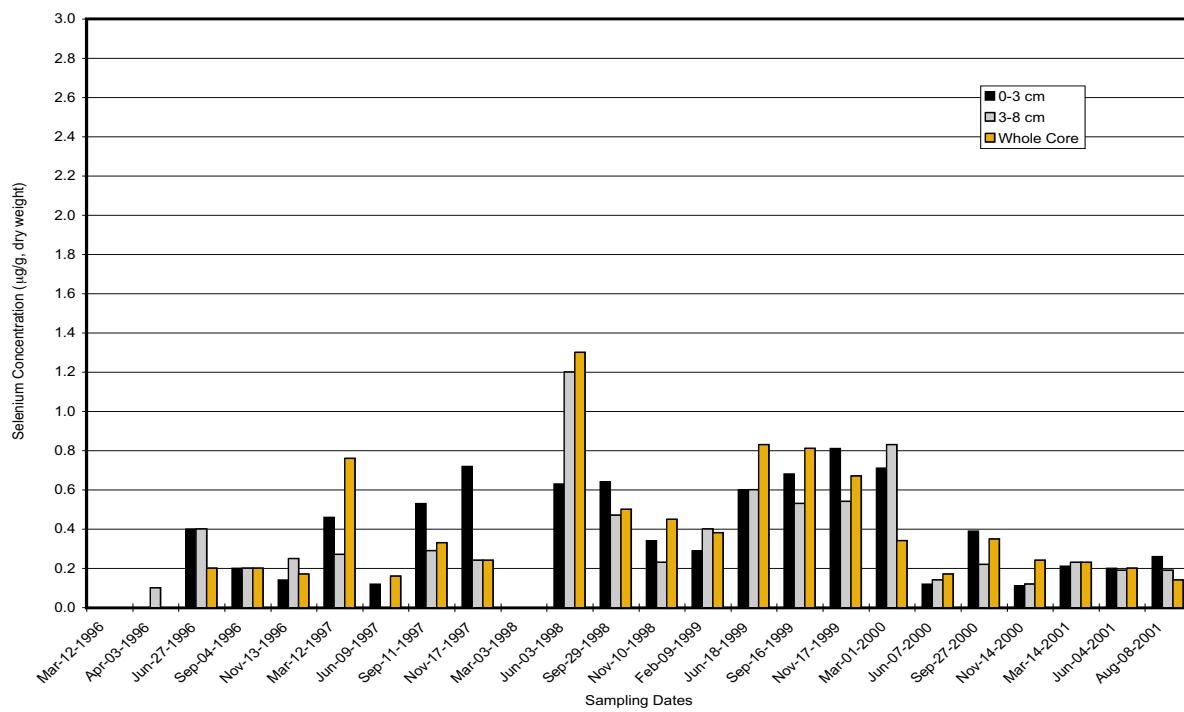
### Station B Selenium in Sediment



### Station C Selenium in Sediment



### Station D Selenium in Sediment



bows in a manner similar to kneading bread. The mixing objective is to obtain one homogeneous sample in each of the bowls. Composited samples are then placed in a wide-mouth polyethylene container and stored in an ice chest at 4°C.

## Results

Table 1 shows information from all of the stations describing each sampling period, each core partition, and each parameter. All values are based on dry weight. Figures 1 through 7 depict the selenium information with the help of bar charts. Further discussion is limited to selenium concentrations only. Data are compared to the following:

#### Guidelines (for Mud and Salt Slough):

- the recommended ecological risk guidelines for selenium concentrations in sediment (Table 1, Chapter 7) are as follows: “no effect” - less than 2 µg/g, dry weight, “level of concern” - 2 to 4 µg/g, dry weight, and “toxicity” - greater than 4 µg/g, dry weight.

#### Criteria (for the San Luis Drain):

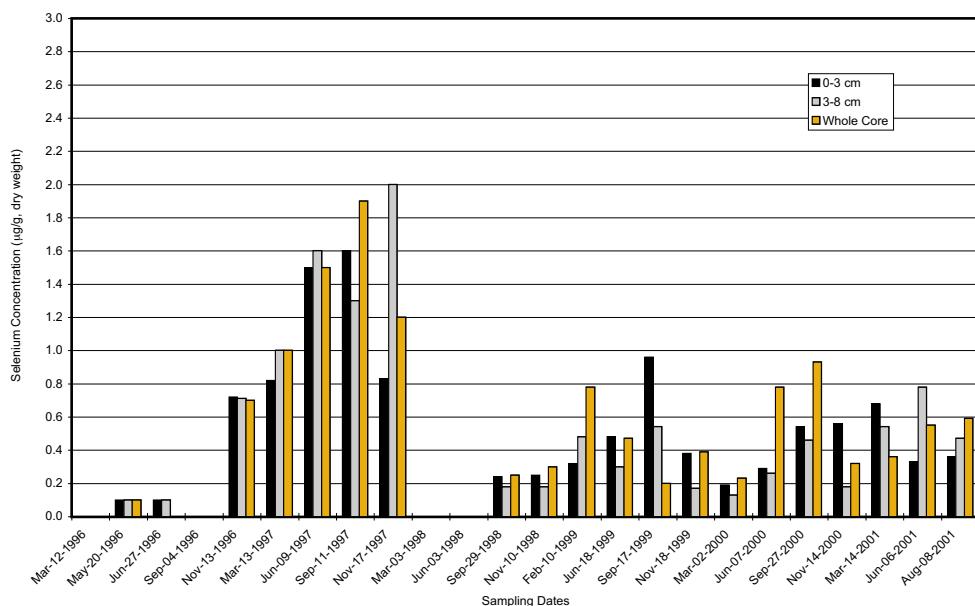
- the California Department of Health Services established a criteria for selenium concentration in sediment of 100 µg/g wet weight. Should the selenium concentrations in sediment from the SLD exceed this value, material dredged from the drain would have to be deposited in a hazardous waste site.

## Ecological risk: Mud and Salt Slough

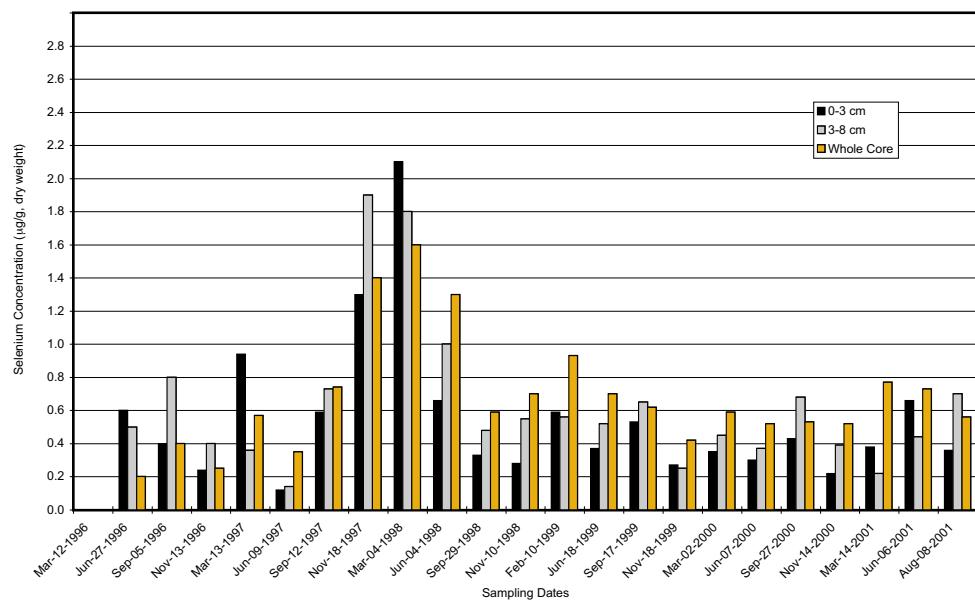
With one exception, selenium concentrations in the sediment from within-slough sampling stations (C, D, I, E, and F) were below the 2.0 µg/g (“no effect level”) for the 5<sup>th</sup> year, last 4 quarterly sampling periods. The November 2000 samples for Station I were above 2.0 µg/g level.

Recapping the 5-year project, the following occurred: one observation was above 2.0 µg/g (no effect range) in Station F (Salt Slough), one observation was above 2.0 µg/g in Station C (Mud Slough), no observations were above 2.0 µg/g in Station D (Mud Slough), eight observations were above 2.0 µg/g in Station I (Mud Slough), and no observations were above 2.0 µg/g in Station E (Mud Slough).

### Station E Selenium in Sediment



### Station F Selenium in Sediment



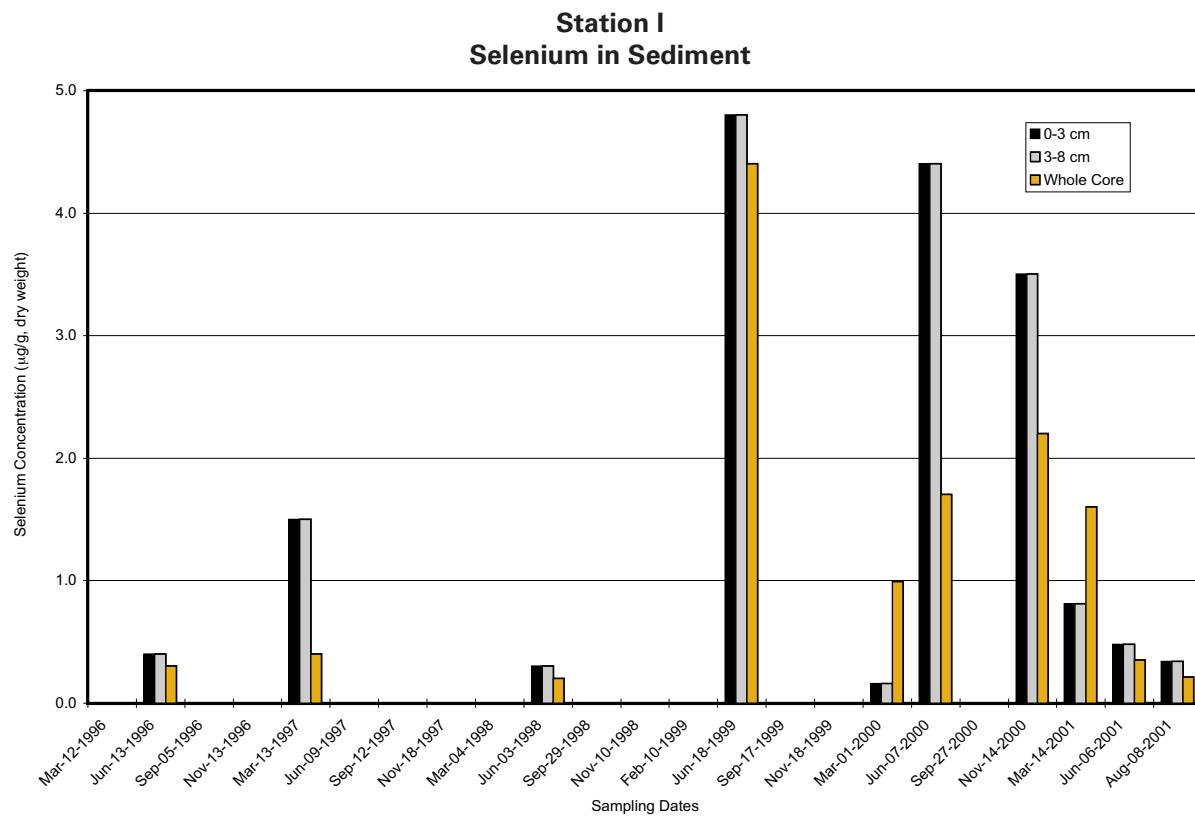
## Hazardous waste material criteria: San Luis Drain

Results from the 5-year project for Stations A and B are depicted in figures 1 and 2. For the entire period of record, the range of selenium concentration values from Station A were 2.0 - 150 µg/g, dry weight. For Station B, the ranges were .11 - 110 µg/g, dry weight. Similar variability was observed in the other 10 locations within

the SLD. The highest selenium values, dry weight, from the SLD were 150 µg/g, 140 µg/g, 100 µg/g, and 100 µg/g. To make the comparison for hazardous waste criteria, the data needs to be converted to a wet weight basis. The formula used to make the comparison is as follows:

$$\text{wet weight} = (\text{dry weight } \mu\text{g/g}) * (1.0 - \text{percent moisture}/100.0).$$

The conversion for the above 4 highest values provides wet weight concentrations of 55 µg/g, 56 µg/g, 40 µg/l, and 38 µg/g, respectively. These concentrations



from the SLD are well below the 100 µg/g wet weight hazardous material criterion established by the California Department of Health Services.

## Quality Control

### Laboratory Precision

Duplicate samples are two discrete samples (aliquots) taken from the same parent material and analyzed independently. The results, which should be similar, demonstrate the laboratory's ability to achieve consistent results. GBP Monitoring Program Quality Assurance protocol requires laboratory re-analysis if there is a relative percent difference (RPD) between duplicates greater than 35%. Table 2 shows results of the duplicate analyses. During the 5-year project, 7 of the 60 duplicate samples differed by more than 35%. In all but one case, the re-analyzed results were similar to the original. Results of duplicate samples collected on June 24, 2001 at Station D were .21 µg/g and 1.5 µg/g, with an RPD of 150.9. Re-analysis yielded values of .20 µg/g and .20 µg/g, respectively.

## Sample Variability

To examine sample variability, two or more samples are collected from the same station during the same sampling event. Table 3 presents all replicate samples collected over the 4 years of the project. Of the 18 replicate samples analyzed, 8 exceeded the QA objective of an RPD  $\leq 35\%$ . No replicated samples were collected during the final year of the Project.

The purpose of the replicate sampling in the San Luis Drain was to demonstrate the variability of selenium concentrations in sediment within the SLD. With 8 out of the 18 samples exceeding the 35 % criteria, the conclusions would be that the selenium in sediments are not necessarily evenly distributed within the SLD. That conclusion led to a new sampling scheme for sampling sediments in the SLD for Phase II of the project. The annual sampling program is now locating the samples based upon the amount of sediment within each reach of the SLD (chapter 10).

Table 1. Sediment Monitoring Results

Sampling Date	Selenium Concentration			Organic Carbon			Percent Moisture		
	0-3 cm ug/g, dry weight	3-8 cm ug/g, dry weight	Whole Core ug/g, dry weight	0-3 cm %	3-8 cm %	Whole Core %	0-3 cm %	3-8 cm %	Whole Core %
<b>Station A</b>									
Mar-13-1996	2.0	16	10	3.9	3.6	3.4	83.3	79.1	80.5
Jun-27-1996	8.0	20	29	4.33	5.01	2.96	83.8	78.30	71.2
Sep-04-1996	3.4	24	7.7	4.35	2.72	4.10	81.2	73.3	76.0
Nov-12-1996	22	62	55	2.92	3.10	3.72	*	*	*
Mar-12-1997	NT	NT	NT	NT	NT	NT	NT	NT	NT
Jun-10-1997	2.9	4.2	5.4	0.89	1.55	2.10	55.0	58.0	62.0
Sep-11-1997	38	56	50	1.52	2.18	1.95	70.6	75.7	70.2
Nov-18-1997	NT	NT	NT	NT	NT	NT	NT	NT	NT
Mar-03-1998	18	150	98	1.21	2.89	2.28	52.9	63.3	65.0
Jun-04-1998	2.8	12	7.0	0.58	1.58	1.03	35.2	54.9	50.0
Sep-28-1998	8.5	23	52	1.06	1.17	2.25	55.0	55.3	67.9
Nov-10-1998	27	140	31	1.55	2.61	1.43	71.0	60.1	59.6
Feb-10-1999	3.0	15	11	1.32	1.45	1.10	69.3	65.0	59.1
Jun-17-1999	2.5	2.7	23	1.03	1.01	1.34	49.6	52.9	56.3
Sep-17-1999	43	16	30	1.11	1.23	2.05	61.4	59.5	68.4
Nov-18-1999	2.9	14	4.3	0.80	1.36	0.93	55.6	59.1	53.3
Mar-02-2000	2.5	2.4	2.4	0.71	0.83	0.98	47.3	48.3	51.4
Jun-06-2000	2.6	2.8	3.0	0.92	0.86	0.87	43.3	44.4	44.1
Sep-27-2000	32	62	70	2.99	2.32	1.81	73.1	70.7	67.9
Nov-14-2000	2.8	2.4	10	1.23	0.87	1.76	54.8	45.4	57.9
Mar-07-2001	3.6	4.0	3.5	1.13	1.45	1.21	43.5	45.3	48.1
Jun-06-2001	2.8	2.4	2.8	1.07	0.8	0.79	45.0	44.4	46.0
Aug-08-2001	NT	NT	NT	NT	NT	NT	NT	NT	NT
<b>Station B</b>									
Mar-12-1996	NT	NT	NT	NT	NT	NT	NT	NT	NT
Jun-27-1996	19	12	30	2.70	2.81	2.15	64.7	59.9	59.0
Sep-04-1996	11	18	20	3.85	3.75	2.08	66.5	61.7	51.2
Nov-12-1996	24	41	40	1.97	1.89	3.45	*	*	*
Mar-13-1997	26	48	42	2.49	2.36	2.66	*	*	*
Jun-10-1997	14	27	0.11	2.14	2.95	0.07	40.0	49.0	58.0
Sep-11-1997	21	61	48	2.39	2.82	1.84	65.9	61.4	53.8
Nov-18-1997	15	28	41	1.62	1.86	1.73	53.8	44.2	50.2
Mar-03-1998	18	41	45	1.46	1.70	1.73	50.8	51.4	54.3
Jun-03-1998	11	21	26	0.85	1.51	1.09	46.6	54.0	46.1
Sep-29-1998	13	15	NT	1.51	1.64	NT	85.9	79.5	NT
Nov-09-1998	17	17	17	1.68	1.74	1.76	73.2	80.8	56.7
Feb-09-1999	15	31	23	0.94	1.93	1.87	61.3	60.9	72.7
Jun-18-1999	17	27	31	1.45	1.84	1.28	56.1	61.4	47.1
Sep-16-1999	20	29	26	1.65	2.03	1.57	51.7	54.7	59.2
Nov-17-1999	38	21	39	2.23	1.96	1.92	58.8	55.6	55.9
Mar-01-2000	65	28	29	1.8	0.99	1.32	59.1	53.8	43.2
Jun-06-2000	NT	NT	NT	NT	NT	NT	NT	NT	NT
Sep-27-2000	NT	NT	NT	NT	NT	NT	NT	NT	40.9
Nov-14-2000	NT	NT	NT	NT	NT	NT	NT	NT	NT
Mar-07-2001	18	53	110	0.67	1.86	NT	NT	NT	59.4
Jun-06-2001	NT	NT	NT	NT	NT	NT	NT	NT	NT
Aug-08-2001	NT	NT	NT	NT	NT	NT	NT	NT	NT

Table 1 (cont). Sediment Monitoring Results

Sampling Date	Selenium Concentration						Organic Carbon						Percent Moisture		
	0-3 cm	3-8 cm	ug/g, dry weight	ug/g, dry weight	NT	Whole Core	0-3 cm	3-8 cm	Whole Core	0-3 cm	3-8 cm	Whole Core	%	%	%
<b>Station C</b>															
Mar-12-1996	0.2	0.2	NT	NT	0.1	0.8	0.6	0.6	NT	NT	NT	NT	NT	NT	NT
May-20-1996	0.1	<0.10	0.1	0.1	0.49	0.40	0.14	0.14	0.53	0.53	0.53	0.34.0	38.5	39.4	36.6
Jun-27-1996	0.3	0.1	<0.10	0.38	0.53	0.28	0.28	0.28	0.28	0.68	0.68	*	*	*	25.2
Sep-04-1996	0.16	0.17	0.31	0.26	0.26	0.28	0.28	0.28	0.28	0.16	0.16	*	*	*	40.6
Nov-12-1996	0.15	<0.10	0.11	0.35	0.31	0.27	0.27	0.27	0.27	0.16	0.16	*	*	*	*
Mar-12-1997	0.11	0.20	<0.10	0.31	0.31	0.27	0.27	0.27	0.27	0.16	0.16	*	*	*	28.0
Jun-09-1997	0.23	0.12	0.44	0.41	0.19	0.92	0.92	0.92	0.92	0.27	0.27	0.27	0.27	0.27	38.6
Sep-11-1997	0.10	0.10	0.10	0.27	0.18	0.32	0.32	0.32	0.32	0.16	0.16	0.16	0.16	0.16	65.5
Nov-17-1997	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Mar-03-1998	0.26	0.31	0.10	0.58	0.62	0.33	0.33	0.33	0.33	0.53	0.53	0.53	0.53	0.53	49.2
Jun-04-1998	0.40	0.35	0.31	0.77	0.70	0.53	0.53	0.53	0.53	0.16	0.16	0.16	0.16	0.16	35.2
Sep-28-1998	0.34	0.23	0.14	0.55	0.66	0.33	0.33	0.33	0.33	0.16	0.16	0.16	0.16	0.16	30.7
Nov-09-1998	0.20	0.13	0.51	0.28	0.21	0.85	0.85	0.85	0.85	0.16	0.16	0.16	0.16	0.16	34.2
Feb-09-1999	0.29	0.19	0.25	0.40	0.22	0.20	0.20	0.20	0.20	0.16	0.16	0.16	0.16	0.16	28.1
Jun-18-1999	0.27	0.32	0.25	0.60	0.67	0.54	0.54	0.54	0.54	0.16	0.16	0.16	0.16	0.16	25.3
Sep-16-1999	0.10	0.10	0.15	0.15	0.15	0.25	0.25	0.25	0.25	0.16	0.16	0.16	0.16	0.16	35.5
Nov-17-1999	3.9	<0.10	<0.10	2.08	0.37	0.45	0.45	0.45	0.45	0.16	0.16	0.16	0.16	0.16	32.0
Mar-01-2000	0.10	0.13	<0.10	0.23	0.37	0.14	0.14	0.14	0.14	0.16	0.16	0.16	0.16	0.16	31.6
Jun-07-2000	0.16	0.17	0.15	0.42	0.41	0.32	0.32	0.32	0.32	0.16	0.16	0.16	0.16	0.16	20.3
Sep-27-2000	<0.10	0.10	0.11	0.15	0.12	0.07	0.07	0.07	0.07	0.16	0.16	0.16	0.16	0.16	28.0
Nov-14-2000	0.19	0.23	0.40	0.33	0.28	0.59	0.59	0.59	0.59	0.16	0.16	0.16	0.16	0.16	22.2
Mar-14-2001	0.14	0.12	0.13	0.65	0.33	0.37	0.37	0.37	0.37	0.16	0.16	0.16	0.16	0.16	29.3
Jun-04-2001	0.16	0.19	0.16	0.46	0.43	0.41	0.41	0.41	0.41	0.16	0.16	0.16	0.16	0.16	28.8
Aug-08-2001															32.1
<b>Station D</b>															
Mar-12-1996	NT	NT	<0.10	0.5	0.5	0.5	0.5	0.5	0.5	NT	NT	NT	NT	NT	NT
Apr-03-1996	0.1	0.2	0.26	0.35	0.19	0.19	0.19	0.19	0.19	NT	NT	NT	NT	NT	23.7
Jun-27-1996	0.4	0.2	0.22	0.20	0.20	0.20	0.20	0.20	0.20	NT	NT	NT	NT	NT	28.5
Sep-04-1996	0.2	0.2	0.17	0.14	0.12	0.12	0.12	0.12	0.12	NT	NT	NT	NT	NT	26.5
Nov-13-1996	0.14	0.25	0.17	0.14	0.12	0.12	0.12	0.12	0.12	NT	NT	NT	NT	NT	18.8
Mar-12-1997	0.46	0.27	0.76	0.28	0.17	0.28	0.28	0.28	0.28	NT	NT	NT	NT	NT	NT
Jun-09-1997	0.12	<0.10	0.16	0.07	0.06	0.11	0.11	0.11	0.11	NT	NT	NT	NT	NT	25.0
Sep-11-1997	0.53	0.29	0.33	0.24	0.22	0.16	0.16	0.16	0.16	NT	NT	NT	NT	NT	22.6
Nov-17-1997	0.72	0.24	0.24	0.54	0.09	0.14	0.14	0.14	0.14	NT	NT	NT	NT	NT	18.8
Mar-03-1998	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Jun-03-1998	0.63	1.2	0.26	1.10	0.29	0.27	0.27	0.27	0.27	NT	NT	NT	NT	NT	38.9
Sep-29-1998	0.64	0.47	0.50	0.29	0.22	0.16	0.16	0.16	0.16	NT	NT	NT	NT	NT	26.5
Nov-10-1998	0.34	0.23	0.45	0.15	0.13	0.18	0.18	0.18	0.18	NT	NT	NT	NT	NT	33.3
Feb-09-1999	0.29	0.40	0.38	0.18	0.27	0.51	0.51	0.51	0.51	NT	NT	NT	NT	NT	32.6
Jun-18-1999	0.60	0.60	0.83	0.79	0.54	0.72	0.72	0.72	0.72	NT	NT	NT	NT	NT	21.9
Sep-16-1999	0.68	0.53	0.81	0.44	0.51	0.85	0.85	0.85	0.85	NT	NT	NT	NT	NT	35.6
Nov-17-1999	0.81	0.54	0.67	0.60	0.55	0.42	0.42	0.42	0.42	NT	NT	NT	NT	NT	39.8
Mar-01-2000	0.71	0.83	0.34	0.41	1.10	0.19	0.19	0.19	0.19	NT	NT	NT	NT	NT	29.5
Jun-07-2000	0.12	0.24	0.13	0.13	0.13	0.08	0.08	0.08	0.08	NT	NT	NT	NT	NT	19.8
Sep-27-2000	0.39	0.22	0.35	0.18	0.13	0.13	0.13	0.13	0.13	NT	NT	NT	NT	NT	23.5
Nov-14-2000	0.11	0.12	0.24	0.13	0.13	0.06	0.06	0.06	0.06	NT	NT	NT	NT	NT	16.2
Mar-14-2001	0.21	0.23	0.23	0.17	0.17	0.13	0.13	0.13	0.13	NT	NT	NT	NT	NT	20.2
Jun-04-2001	0.20	0.19	0.20	0.17	0.17	0.13	0.13	0.13	0.13	NT	NT	NT	NT	NT	25.0
Aug-08-2001	0.26	0.19	0.14	0.14	0.14	0.12	0.12	0.12	0.12	NT	NT	NT	NT	NT	20.5

Table 1 (cont.). Sediment Monitoring Results

Sampling Date	Selenium Concentration			Organic Carbon			Percent Moisture		
	0-3 cm ug/g, dry weight	3-8 cm ug/g, dry weight	Whole Core ug/g, dry weight	0-3 cm %	3-8 cm %	Whole Core %	0-3 cm %	3-8 cm %	Whole Core %
<b>Station E</b>									
Mar-12-1996	NT	NT	NT	NT	NT	NT	NT	NT	NT
May-20-1996	0.1	0.1	<0.1	1.08	0.45	0.40	37.9	32.7	34.5
Jun-27-1996	NT	NT	NT	NT	NT	NT	NT	NT	NT
Sep-04-1996	0.1	0.1	0.1	0.08	0.12	0.16	0.06	*	*
Nov-13-1996	NT	NT	0.71	0.70	0.38	0.30	0.31	*	*
Mar-13-1997	0.72	0.82	1.0	1.0	0.65	0.72	0.74	44.0	44.0
Jun-09-1997	1.5	1.6	1.5	1.5	0.69	0.52	0.78	42.0	45.8
Sep-11-1997	1.6	1.3	1.9	1.2	0.29	0.31	0.39	29.3	29.3
Nov-17-1997	0.83	2.0	1.2	NT	NT	NT	NT	NT	NT
Mar-03-1998	NT	NT	NT	NT	NT	NT	NT	NT	NT
Jun-03-1998	NT	NT	NT	NT	NT	NT	NT	NT	NT
Sep-29-1998	0.24	0.18	0.25	0.16	0.18	0.21	0.21	31.6	26.8
Nov-10-1998	0.25	0.18	0.30	0.13	0.15	0.39	0.39	31.8	32.5
Feb-10-1999	0.32	0.48	0.78	0.32	0.54	0.45	0.45	37.4	38.0
Jun-18-1999	0.48	0.47	0.47	0.24	0.16	0.32	0.32	33.1	43.5
Sep-17-1999	0.96	0.54	0.20	0.44	0.24	0.08	0.08	27.4	49.7
Nov-18-1999	0.38	0.17	0.39	0.17	0.13	0.26	0.26	44.0	8.2
Mar-02-2000	0.19	0.13	0.23	0.32	0.13	0.23	0.23	28.0	30.7
Jun-07-2000	0.29	0.26	0.78	0.19	0.19	0.30	0.30	36.0	27.1
Sep-27-2000	0.46	0.93	0.20	0.23	0.51	0.51	0.51	33.4	30.4
Nov-14-2000	0.54	0.46	0.32	0.14	0.22	0.22	0.22	29.9	29.4
Mar-14-2001	0.56	0.54	0.36	0.40	0.07	0.11	0.11	17.5	20.2
Jun-06-2001	0.68	0.78	0.55	0.18	0.28	0.27	0.27	29.6	27.0
Aug-08-2001	0.33	0.47	0.59	0.14	0.24	0.24	0.24	30.2	19.7
	0.36							20.2	25.1
								21.7	
<b>Station F</b>									
Mar-12-1996	NT	NT	NT	NT	NT	NT	NT	NT	NT
Jun-27-1996	0.6	0.5	0.2	0.69	0.58	0.18	41.9	33.3	28.9
Sep-05-1996	0.4	0.8	0.4	0.44	0.75	0.25	38.7	40.6	29.7
Nov-13-1996	0.24	0.40	0.25	0.05	0.16	0.05	*	*	*
Mar-13-1997	0.94	0.36	0.57	0.56	0.36	0.32	*	*	*
Jun-09-1997	0.12	0.14	0.35	0.08	0.12	0.26	26.0	20.0	29.0
Sep-12-1997	0.59	0.73	0.74	0.23	0.22	0.23	28.0	26.9	23.8
Nov-18-1997	1.3	1.9	1.4	1.16	1.43	1.12	47.3	46.9	44.6
Mar-04-1998	2.1	1.8	1.6	2.32	1.97	2.11	42.0	70.0	42.2
Jun-04-1998	0.66	1.0	1.3	0.49	0.59	1.48	34.8	31.2	50.7
Sep-29-1998	0.33	0.48	0.59	0.26	0.31	0.23	26.8	26.1	29.2
Nov-10-1998	0.28	0.55	0.70	0.21	0.26	0.33	26.7	33.7	29.0
Feb-10-1999	0.59	0.56	0.93	0.40	0.32	0.19	33.1	30.5	31.6
Jun-18-1999	0.37	0.52	0.70	0.22	0.27	0.37	29.8	26.3	28.5
Sep-17-1999	0.53	0.65	0.62	0.49	0.53	0.22	35.5	36.8	33.8
Nov-18-1999	0.27	0.25	0.42	0.33	0.24	0.26	36.5	25.6	27.0
Mar-02-2000	0.35	0.45	0.59	0.29	0.26	0.32	23.8	23.3	21.2
Jun-07-2000	0.30	0.37	0.52	0.24	0.24	0.35	27.9	24.6	20.5
Sep-27-2000	0.43	0.68	0.53	0.34	0.24	0.34	36.8	37.1	28.6
Nov-14-2000	0.22	0.39	0.52	0.18	0.25	0.20	29.1	26.7	37.0
Mar-14-2001	0.38	0.22	0.77	0.40	0.23	0.48	27.7	24.5	25.3
Jun-06-2001	0.66	0.44	0.73	0.21	0.22	0.27	27.4	21.4	21.5
Aug-08-2001	0.36	0.70	0.56	0.31	0.18	0.34	28.4		

Table 1 (cont). Sediment Monitoring Results

Sampling Date	Selenium Concentration						Organic Carbon			Percent Moisture		
	0-3 cm		3-8 cm		Whole Core		0-3 cm		3-8 cm		Whole Core	
	ug/g, dry weight		ug/g, dry weight		ug/g, dry weight	%	%	%	%	%	%	%
<b>Station I</b>												
Jun-13-1996	0.4	0.4	0.3	1.6	1.3	1.2	7.8	17.2	*	*	24.9	*
Mar-13-1997	1.5	0.8	0.4	1.76	0.79	0.56	26.4	20.6			20.3	
Jun-03-1998	0.3	0.2	0.2	0.47	0.69	0.55						
Jun-18-1999	4.8	4.5	4.4	1.90	1.89	1.96	16.1	25.1	25.9			
Mar-01-2000	0.16	1.7	0.99	0.43	1.35	0.90	44.3	33.7	30.8			
Jun-07-2000	4.4	2.2	1.7	1.92	1.55	1.39	4.6	20.9	20.1			
Nov-14-2000	3.5	1.5	2.2	1.91	1.17	1.23	39.6	29.1	33.8			
Mar-14-2001	0.81	1.3	1.6	0.80	1.16	1.01	28.3	30.5	33.3			
Jun-06-2001	0.48	0.25	0.36	0.49	0.57	0.52	36.5	34.3	32.2			
Aug-08-2001	0.34	0.32	0.21	0.26	0.28	0.14	22.9	24.1	25.0			
<b>San Luis Drain - Annual Survey</b>												
<b>30' South of Check 1 (1-2-C)</b>												
Jun-10-1997	9.6	4.7	26	1.19	1.93	1.69	36.0	51.0	52.0			
Jun-03-1998	22	9.7	29	1.49	1.49	1.55	49.7	44.8	44.9			
Jun-16-1999	5.3	8.5	59	0.81	0.97	2.13	50.2	39.8	58.7			
Jun-05-2000	14	15	15	1.33	1.55	1.11	54.0	53.6	40.1			
Jun-05-2001	8.9	11	14	1.53	1.59	1.78	61.3	54.7	60.3			
<b>Midpoint of Checks 1 &amp; 2 (1-2-B)</b>												
Jun-10-1997	39	96	51	2.11	2.25	1.56	56.0	53.0	47.0			
Jun-03-1998	64	68	8.3	1.53	1.71	1.31	56.3	52.7	55.4			
Jun-16-1999	8.8	11	14	1.30	1.45	1.53	62.9	57.6	55.8			
Jun-05-2000	9.4	8.4	18	1.35	1.27	1.46	65.9	59.6	57.1			
Jun-05-2001	9.5	8.0	12	1.66	1.32	1.6	66.5	57.8	60.0			
<b>50' North of Check 2 (1-2-A)</b>												
Jun-10-1997	NT	NT	NT	NT	NT	NT	NT	NT	NT			
Jun-03-1998	15	NT	21	0.65	NT	0.97	42.6	NT	NT			
Jun-16-1999	19	64	71	1.99	2.68	2.27	35.5	49.0	54.9			
Jun-05-2000	14	29	67	0.85	1.12	1.66	25.0	32.2	44.1			
Jun-05-2001	18	71	48	1.05	1.9	1.92	19.7	43.6	43.2			
<b>50' South of Check 10 (10-11 C)</b>												
Jun-10-1997	7.2	15	31	1.28	1.34	2.67	50.0	57.0	42.0			
Jun-04-1998	21	39	17	0.72	1.66	1.43	44.0	62.6	56.4			
Jun-16-1999	19	75	16	0.93	2.07	1.34	43.8	61.5	52.8			
Jun-05-2000	47	84	41	1.23	1.65	1.85	49.6	57.1	60.9			
Jun-05-2001	39	140	33	1.32	3.05	1.74	36.0	65.5	52.0			
<b>Midpoint of Checks 10 &amp; 11 (10-11 B)</b>												
Jun-10-1997	11	12	NT	1.57	1.16	NT	59.0	48.0	NT			
Jun-04-1998	7.5	8.7	17	0.91	0.93	1.43	54.0	45.1	72.6			
Jun-16-1999	26	8.4	6.0	1.24	0.89	0.56	51.5	52.8	39.4			
Jun-05-2000	7.5	22	5.8	1.28	0.99	0.93	61.4	52.8	53.2			
Jun-05-2001	10	14	10	1.40	1.86	1.43	54.1	60.7	61.8			
<b>50' North of Check 11 (10-11 A)</b>												
Jun-10-1997	24	43	39	1.41	1.97	1.83	48.0	57.0	53.0			
Jun-04-1998	18	55	50	1.14	2.57	1.68	47.2	61.2	53.5			
Jun-16-1999	14	26	45	0.61	1.82	1.56	34.7	47.1	53.1			
Jun-05-2000	12	58	51	0.66	2.55	1.69	32.1	64.4	54.1			
Jun-05-2001	16	64	50	1.25	2.51	2.31	36.3	59.8	50.4			

Table 1 (cont.). Sediment Monitoring Results

Sampling Date	0-3 cm	Selenium Concentration		Whole Core ug/g, dry weight	0-3 cm % ug/g, dry weight	3-8 cm % ug/g, dry weight	Organic Carbon Whole Core %	0-3 cm %	3-8 cm %	Percent Moisture Whole Core %
		0-3 cm ug/g, dry weight	3-8 cm ug/g, dry weight							
<b>50' South of Check 14 (14-15 C)</b>										
Jun-11-1997	7.1	34	8.0	1.54	2.62	1.93	63.0	70.0	63.0	63.0
Jun-04-1998	31	11	42	0.85	1.96	1.11	45.2	67.4	42.3	42.3
Jun-16-1999	4.0	11	13	1.00	1.87	1.30	60.3	63.6	62.0	62.0
Jun-05-2000	5.3	4.8	45	1.34	1.36	2.41	60.6	41.0	63.1	63.1
Jun-05-2001	4.9	4.8	14	1.11	1.17	2.66	52.1	51.3	62.5	62.5
<b>Midpoint of Checks 14 &amp; 15 (14-15 B)</b>										
Jun-11-1997	2.9	22	10	0.38	1.11	1.91	29.0	49.0	56.0	56.0
Jun-04-1998	3.4	3.4	5.7	1.04	1.08	1.17	55.2	54.9	58.0	58.0
Jun-17-1999	3.0	3.1	3.0	0.95	0.96	0.94	58.0	56.0	52.6	52.6
Jun-06-2000	3.3	4.1	3.1	0.93	0.99	0.93	56.0	52.5	53.3	53.3
Jun-05-2001	5.1	4.7	5.1	1.24	1.15	1.19	61.5	56.8	57.6	57.6
<b>50' North of Check 15 (14-15 A)</b>										
Jun-11-1997	40	48	3.8	2.37	2.83	0.59	63.0	67.0	63.0	63.0
Jun-04-1998	29	47	59	1.46	2.87	3.21	51.8	65.5	68.7	68.7
Jun-17-1999	43	76	76	3.64	3.23	2.84	61.9	65.2	63.5	63.5
Jun-06-2000	23	76	55	0.79	2.42	2.32	35.3	53.5	53.0	53.0
Jun-05-2001	43	76	62	2.13	2.93	2.37	37.4	62.2	56.9	56.9
<b>Midpoint of Checks 17 &amp; 18 (17-18 B)</b>										
Jun-10-1997	2.7	3.5	3.8	0.67	0.80	1.82	46.0	45.0	66.0	66.0
Jun-03-1998	2.0	2.8	2.7	0.57	0.83	0.90	24.8	34.1	44.9	44.9
Jun-17-1999	2.3	1.6	1.6	0.59	0.71	0.52	45.5	37.9	40.3	40.3
Jun-06-2000	2.2	2.0	1.9	0.76	0.66	0.59	36.3	38.9	38.9	38.9
Jun-06-2001	1.8	2.0	2.1	0.47	0.60	0.54	34.3	35.6	39.6	39.6
<b>50' North of Check 18 (17-18 A)</b>										
Jun-10-1997	48	66	100	2.37	1.92	2.98	57.0	54.0	60.0	60.0
Jun-03-1998	35	65	75	1.25	2.39	2.33	38.0	53.8	57.4	57.4
Jun-17-1999	38	100	87	1.11	5.19	3.16	47.6	62.2	61.6	61.6
Jun-06-2000	26	49	43	0.81	1.84	1.54	35.6	47.9	45.7	45.7
Jun-06-2001	11	32	50	0.96	2.10	1.96	40.7	58.8	46.7	46.7

NT = Not Tested

\* = Lost Data

Reporting Limit: Selenium, 0.01 ug/g

Significant Digits: Selenium, 2

Organic Carbon, 2 or 3

Percent Moisture, 2 or 3

Laboratory: March 1996 to September 1996

October 1996 to Present

USBR Laboratory / Sacramento

USGS Laboratory / Denver

**Table 2. Sediment Monitoring to Measure Laboratory Precision (Duplicates)**

Station	Sample Type	Sampling Date	Original ug/g	Re-sample ug/g	Quality Control Duplicate ug/g	Re-sample ug/g	RPD Per Cent
<b>Water Year 1997</b>							
B	3-8 cm	Nov-12-1996	41	43	26	28	44.8
E	3-8 cm	Mar-13-1997	1.0		0.96		4.1
B	whole	Mar-13-1997	42		41		2.4
C	3-8 cm	Jun-09-1997	0.20		0.20		0.0
B	3-8 cm	Jun-10-1997	27	31	18	19	40.0
A	3-8 cm	Jun-10-1997	4.2		4.3		2.4
1-2 B	whole	Jun-10-1997	51		54		5.7
10-11 C	0-3 cm	Jun-10-1997	7.2		7.2		0.0
14-15 B	3-8 cm	Jun-11-1997	22		21		4.7
17-18 A	whole	Jun-10-1997	100		86		15.1
B	whole	Sep-11-1997	48		43		11.0
A	whole	Sep-11-1997	50	48	21	23	81.7
<b>Water Year 1998</b>							
C	3-8 cm	Nov-17-1997	0.10		0.10		0.0
E	0-3 cm	Nov-17-1997	0.83		0.89		7.0
B	3-8 cm	Mar-03-1998	41		40		2.5
A	whole	Jun-04-1998	7.0		6.6		5.9
D	3-8 cm	Jun-03-1998	1.2		1.1		8.7
17-18 A	whole	Jun-04-1998	75		79		5.2
1-2 B	3-8 cm	Jun-03-1998	68		76		11.1
10-11 C	3-8 cm	Jun-04-1998	39		39		0.0
10-11 A	0-3 cm	Jun-04-1998	18		22		20.0
A	3-8 cm	Sep-28-1998	23		23		0.0
E	whole	Sep-29-1998	0.25		0.25		0.0
<b>Water Year 1999</b>							
B	0-3 cm	Nov-09-1998	17		17		0.0
A	whole	Nov-10-1998	31		30		3.3
B	3-8 cm	Feb-09-1999	31		30		3.3
E	whole	Feb-10-1999	0.78		0.86		9.8
A	whole	Feb-10-1999	11		11		0.0
A	whole	Jun-17-1999	23	21	14	13	48.6
I	3-8 cm	Jun-18-1999	4.5		4.4		2.2
B	3-8 cm	Jun-18-1999	27		28		3.6
1-2 B	3-8 cm	Jun-16-1999	11		11		0.0
10-11 C	whole	Jun-16-1999	16		18		11.8
14-15 B	3-8 cm	Jun-17-1999	3.1		4.2		30.1
B	3-8 cm	Sep-16-1999	29		30		3.4
A	whole	Sep-17-1999	30		29		3.4
<b>Water Year 2000</b>							
B	whole	Nov-17-1999	39	44	14	16	94.3
A	whole	Nov-18-1999	4.3		3.8		12.3
I	whole	Mar-01-2000	0.99		0.97		2.0
B	whole	Mar-01-2000	29		30		3.4
A	whole	Mar-02-2000	2.4		2.4		0.0
I	3-8 cm	Jun-07-2000	2.2		2.3		4.4
D	whole	Jun-07-2000	0.17		0.15		12.5
1-2 C	whole	Jun-05-2000	15		14		6.9
10-11 C	whole	Jun-05-2000	41		41		0.0
10-11 A	whole	Jun-05-2000	51		49		4.0
17-18 B	3-8 cm	Jun-06-2000	2.0		2.0		0.0
A	whole	Sep-27-2000	70	65	120	111	52.6
D	whole	Sep-27-2000	0.35		0.36		2.8
<b>Water Year 2001</b>							
A	whole	Nov-14-2000	10		10		0.0
D	whole	Nov-14-2000	0.24		0.20		18.2
B	whole	Mar-07-2001	110		130		16.7
D	whole	Mar-14-2001	0.23		0.21		9.1
F	whole	Mar-14-2001	0.77		0.51		40.6
D	whole	Jun-04-2001	0.21	0.20	1.5	0.20	150.9
1/2 B	whole	Jun-05-2001	12		12		0.0
10/11 A	whole	Jun-05-2001	50		50		0.0
14/15 B	whole	Jun-05-2001	5.1		5.1		0.0
I	whole	Aug-08-2001	0.21		0.24		13.3
C	whole	Aug-08-2001	0.16		0.14		13.3

**Table 3. Sediment Monitoring to Measure Repeatability (Replicates)**

Station	Sample Type	Sampling Date	Original ug/g	Replicate ug/g	Absolute Difference ug/g	RPD Per Cent
<b>Water Year 1997</b>						
A	0-3 cm	Jun-10-1997	48	30	18	46.2
A	3-8 cm	Jun-10-1997	66	53	13	21.8
A	whole	Jun-10-1997	100	77	23	26.0
<b>Water Year 1998</b>						
14-15 C	0-3 cm	Jun-04-1998	31	14	17	75.6
14-15 C	3-8 cm	Jun-04-1998	11	19	8	53.3
14-15 C	whole	Jun-04-1998	42	24	18	54.5
<b>Water Year 1999</b>						
A	0-3 cm	Jun-17-1999	2.5	3.1	0.6	21.4
A	3-8 cm	Jun-17-1999	2.7	3.0	0.3	10.5
A	whole	Jun-17-1999	23	4.2	18.8	138.2
1-2 C	0-3 cm	Jun-16-1999	5.3	7.6	2.3	35.7
1-2 C	3-8 cm	Jun-16-1999	8.5	10	1.5	16.2
1-2 C	whole	Jun-16-1999	59	29	30	68.2
<b>Water Year 2000</b>						
A	0-3 cm	Jun-06-2000	2.6	2.5	0.1	3.9
A	3-8 cm	Jun-06-2000	2.8	3.1	0.3	10.2
A	whole	Jun-06-2000	3.0	4.2	1.2	33.3
14-15 C	0-3 cm	Jun-06-2000	5.3	4.0	1.3	28.0
14-15 C	3-8 cm	Jun-06-2000	4.8	5.3	0.5	9.9
14-15 C	whole	Jun-06-2000	4.5	7.8	3.3	53.7

